

TABLE I

	property measured	value observed
	Viscosity @ 1 radian/sec	220,600 poise
5	Cure Exotherm Peak Temperature	121.3°C
	Linear Coefficient of Thermal Expansion from 50°C to 150°C	154ppm/°C
	Tensile Strength at Break	1310 psi
10	Elongation at Break	25.3 percent
	Modulus @ 25% elongation	30.5 psi
	Specific Gravity	1.52
	Durometer	91.5 Shore A
15	Dielectric Constant 100 Hz	2.9
	Dielectric Constant 100 kHz	2.9
	Dissipation Factor 100 Hz	0.0004
20	Dissipation Factor 100 kHz	<0.0002
	Volume Resistivity	1.4×10^{15} ohm-cm
	Dielectric Strength	507 V/mil
25		

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TABLE II

TEST	TEST DESCRIPTION	QUANTITY TESTED	RESULTS
Preconditioning	24 hour 125°C bake, 168 hrs. 85°C/85% RH soak ⁴ , 3x reflow at 220°C (EIA/JEDEC Standard JESD22-A113-B ⁶)	38	0 failures
Temperature Cycle on FR-Board ¹	-40°C to 125°C ⁵ , cycle to 50% failure	30	0 failures ² /250 cycles 0 failures ² /500 cycles 0 failures ² /750 cycles 0 failures ² /1000 cycles 0 failures ² /1250 cycles 0 failures ² /1500 cycles
Temperature Cycle Package Only	-55°C to 125°C ³	8	0 failures ² /250 cycles 0 failures ² /500 cycles 0 failures ² /750 cycles 0 failures ² /1000 cycles

¹Package solder balls reflowed attaching the package to an epoxy fiberglass (FR-4) board simulating actual usage.

²Failure is defined as an open or short when voltage is applied.

³MIL-STD-883 1010.7 Temperature Cycling Test Method Test Condition B.

⁴10 minute soak times are used at each temperature extreme with testing of each electrical I/O for shorts at indicated times.

⁵MIL-STD-883(modified test condition per specification)

⁶Joint Electron Devices Engineering Council

PROCESS STEPS TABLE

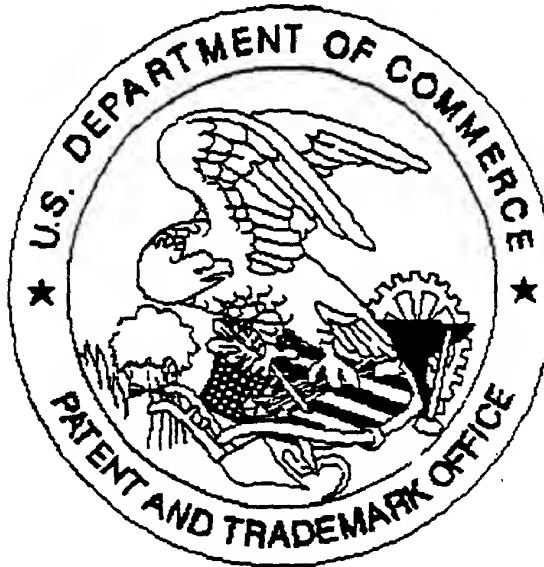
(a comparison of the prior art methods to the methods
of the inventive process disclosed and claimed herein)

TYPE OF PROCESS						
5	Step	Print Spacers/ Print Die	Print Spacers/ Dispense Die	A*	B**	
	No.	Attach	Attach	Use Pad Adhesive	As Dots	As Pad
10	1	Print Spacers	Print Spacers	Remove liner	Print Spacers	Dispense Adhesive
	2	Cure Spacers	Cure Spacers	Punch or Place Adhesive	Attach hot die	Attach Hot die
15	3	Print die attach	Dispense die attach	Apply pressure and/or heat		
	4	Attach hot die	Attach hot die	Remove liner		
20	5			Attach hot die		

* A is a composition of this invention wherein dots are used as the spacer material.

** B is a composition of this invention wherein pads are used as the spacer material.

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